

# **Toxic Industrial Chemical Release Response Preventive Medicine Measures**

**Name  
Command  
Contact Information**

**Prepared by:  
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# Agenda

- Purpose
- Background
- Health Threats
- Exposure & Protection
- Stress
- Post Deployment
- Summary



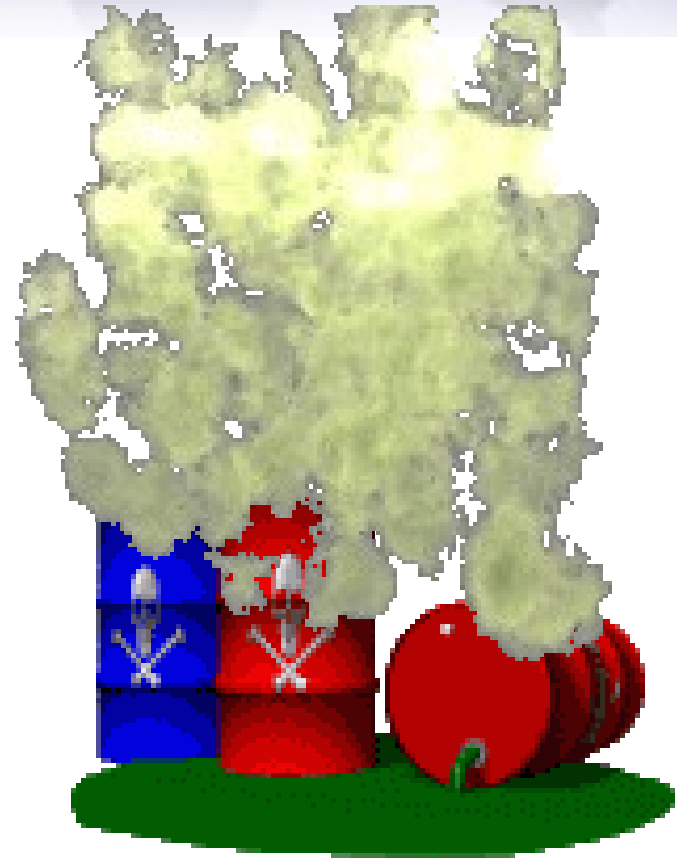
# Purpose

Inform Deploying Personnel  
(Military and Civilian) of the  
Potential Health Hazards and the  
Individual Countermeasures  
Necessary to Assure Personal  
Safety and Health



# Background


- US Forces are mobilizing and deploying in support of toxic industrial chemical (TIC) response efforts
- Environmental and occupational health hazards are a potential medical threat to deployed personnel



**TICs are common commercially produced chemicals that pose a risk of adverse health effects if released**



# Deployment Health Guide

- Unfold YOUR *TIC Release Response, Deployment Health Guide*
- Reference Guide for this Briefing 

**This guide is for use by all active/reserve component military, civilian, retiree, and contractor personnel. Any individual who trains and prepares for, or participates in this type of military operation should keep and refer to this guide.**



# Pre-Deployment

- All Active Component (AC) personnel must complete a Pre-Deployment Medical Health Assessment (DD Form 2795)
- Reserve Component (RC) personnel activated to active duty status greater than 30 days must complete DD Form 2795. Only those RC activated for 30 days or less are exempt from completing the form.

# Military Vaccine Recommendations

- Normal vaccine requirements apply:
  - Tetanus-diphtheria (Td) if no booster within the past 10 years
  - Hepatitis A
  - Hepatitis B for those at risk with direct blood and body fluid exposures
  - Influenza (during flu season)
  - Typhoid



# Coordination & Communication

- Before deployment, coordinate with CBRN staff to determine appropriate safety and health procedures, including PPE
- How does your mission fit into the overall response?
- In the U.S., federal, state, and local authorities will likely have higher authority  
Coordinate with on-scene agencies
- On-site preventive medicine officer should monitor and document exposures





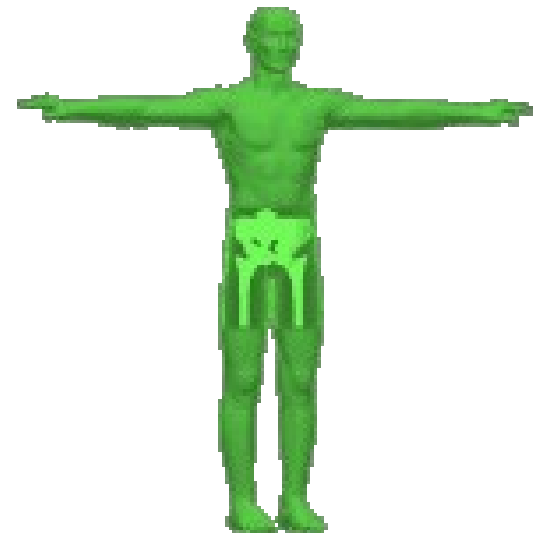
A blue-tinted background image showing a molecular structure with spheres and connecting lines, representing chemical bonds.

# Exposure Scenarios

- TICs of concern:
  - Primarily gases or volatile liquids
  - Primary hazard is toxic vapors
- Exposure can result from:
  - Accidental release
  - Intentional release
  - Explosion or attack
- Key areas of concern:
  - Industrial facilities
  - Water treatment plants
  - Waste / fuel storage
  - Laboratory settings
  - Major transportation nodes

# Health Effects

- Depends on
  - Type
  - Route of exposure
  - Concentration
  - Duration
  - Health of exposed person



A blue-tinted background image showing a molecular structure with spheres and connecting lines, representing chemical bonds.

# Detection

- Most military equipment is not designed to detect TICs
- HAZMAT responders will likely use commercially available devices specifically designed to detect TICs
- Some military units have commercial equipment
- Use requires proper training



# Protection

- Unit preventive medicine should determine appropriate personal protective equipment (PPE)
- Military protective equipment is not specifically designed for TICs
- The M40 mask offers limited protection – use only for emergency evacuation
- Use commercial level A thru D PPE
- Use commercial level A PPE for unknowns

# Physical Injury



- **PPE can hinder vision and movement**
- **PPE is very hot when hot outside**
- **Beware of sharp objects and hazards beneath liquids**
- **Handling debris can compromise the integrity of PPE**

## ***PREVENTION***

- **Remain alert**
- **Use the buddy system**
- **Follow all safety guidelines**

# Heat Injury Prevention

- **Prevention is key to avoid heat injury**
- Heat Cramps, Exhaustion, or Stroke

## ***PREVENTION***



- Drink fluids continuously (hourly fluid intake should not exceed 1.5 quarts, daily fluid intake should not exceed 12 quarts)
- Maintain acclimatization
- Avoid dietary supplements EPHEDRA and Creatin
- Protect yourself from exposure to sunlight and wind
- Maintain good physical condition
- Establish work/rest schedules
- Wear proper clothing
- Participate in training





# Heat Injury Prevention

- Heat stroke
  - Deadly
  - Skin will be hot, usually dry
  - Confused or delirious
  - **COOL IMMEDIATELY and seek medical aid**
- Heat exhaustion
  - Still sweating, but extremely weak, clammy skin
  - REST AND REPLACE FLUIDS
- Heat cramps
  - Muscle spasms due to salt loss
  - Sports drinks may help

# HEAT

- H:** Heat category – WBGT Index
- E:** Exertion level (prior 3 days)
- A:** Acclimatization
- T:** Tables – Water/Work/Rest



## REMEMBER

**Water requirements are not reduced by any form of training or acclimatization.**

# Work/Rest and Water Consumption Table

*Applies to average sized, heat-acclimated soldier wearing BDU, hot weather. (See TB MED 507 for further guidance.)*

Easy Work	Moderate Work	Hard Work
<ul style="list-style-type: none"> <li>• Weapon Maintenance</li> <li>• Walking Hard Surface at 2.5 mph, &lt; 30 lb Load</li> <li>• Marksmanship Training</li> <li>• Drill and Ceremony</li> <li>• Manual of Arms</li> </ul>	<ul style="list-style-type: none"> <li>• Walking Loose Sand at 2.5 mph, No Load</li> <li>• Walking Hard Surface at 3.5 mph, &lt; 40 lb Load</li> <li>• Calisthenics</li> <li>• Patrolling</li> <li>• Individual Movement Techniques, i.e., Low Crawl or High Crawl</li> <li>• Defensive Position Construction</li> </ul>	<ul style="list-style-type: none"> <li>• Walking Hard Surface at 3.5 mph, ≥ 40 lb Load</li> <li>• Walking Loose Sand at 2.5 mph with Load</li> <li>• Field Assaults</li> </ul>

- The work/rest times and fluid replacement volumes will sustain performance and hydration for at least 4 hrs of work in the specified heat category. Fluid needs can vary based on individual differences ( $\pm \frac{1}{4}$  qt/hr) and exposure to full sun or full shade ( $\pm \frac{1}{4}$  qt/hr).

• **NL** = no limit to work time per hr.

• **Rest** = minimal physical activity (sitting or standing) accomplished in shade if possible.

• **CAUTION: Hourly fluid intake should not exceed 1½ qts.**

*Daily fluid intake should not exceed 12 qts.*

• If wearing body armor, add 5°F to WBGT index in humid climates.

• If doing Easy Work and wearing NBC (MOPP 4) clothing, add 10°F to WBGT index.

• If doing Moderate or Hard Work and wearing NBC (MOPP 4) clothing, add 20°F to WBGT index.

Heat Category	WBGT Index, F°	Easy Work		Moderate Work		Hard Work	
		Work/Rest (min)	Water Intake (qt/hr)	Work/Rest (min)	Water Intake (qt/hr)	Work/Rest (min)	Water Intake (qt/hr)
1	78° - 81.9°	NL	$\frac{1}{2}$	NL	$\frac{3}{4}$	40/20 min	$\frac{3}{4}$
2 (GREEN)	82° - 84.9°	NL	$\frac{1}{2}$	50/10 min	$\frac{3}{4}$	30/30 min	1
3 (YELLOW)	85° - 87.9°	NL	$\frac{3}{4}$	40/20 min	$\frac{3}{4}$	30/30 min	1
4 (RED)	88° - 89.9°	NL	$\frac{3}{4}$	30/30 min	$\frac{3}{4}$	20/40 min	1
5 (BLACK)	> 90°	50/10 min	1	20/40 min	1	10/50 min	1

For additional copies, contact: U.S. Army Center for Health Promotion and Preventive Medicine Health Information Operations Division at (800) 222-9698 or CHPPM - Health Information Operations@apg.amedd.army.mil.

For electronic versions, see <http://chppm-www.apgea.army.mil/heat>. Local reproduction is authorized.

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# **COLD INJURY PREVENTION**

- Hypothermia, Frostbite, Chilblains

## **COUNTERMEASURES**

- When possible, remain inside warming tents/buildings and drink warm, un-caffeinated liquids for relief from the cold
- If working outside or on guard duty, insulate yourself from the ground and wind. Rotate duty as frequently as mission allows.
- Properly wear the Extended Cold Weather Clothing System



**You should receive annual unit training on prevention of cold injury**

# COLDER

- C:** Keep clothing Clean
- O:** Avoid Overheating.
- L:** Wear clothing Loose and in layers
- D:** Keep clothing as Dry as possible
- E:** Examine clothing (holes, tears, broken fasteners)
- R:** Repair or replace damaged clothing



**Notify your first-line supervisor if you have had a previous cold injury. Use the buddy system.**



# Wind Chill Chart



		Temperature (°F)																		
		Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Wind (mph)	5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63	
	10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72	
	15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77	
	20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81	
	25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84	
	30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87	
	35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89	
	40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91	
	45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93	
	50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95	
	55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97	
	60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98	

Frostbite Times



30 minutes



10 minutes



5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

**WET SKIN CAN SIGNIFICANTLY DECREASE THE TIME FOR FROSTBITE TO OCCUR**



# Medical Treatment

- After exposure, limit exertion and monitor for symptoms for up to several hours
- For acid gases – observe directly for the first hour and to a lesser extent for six hours total
- Most exposures are treated symptomatically
- Only a few have specific antidotes



# Persistence and Decon

1 of 2

- Remove liquid TIC from skin asap with large amounts of water
- Most TICs of concern will not require decon since they are very volatile and will dissipate rapidly ( $< 1\text{hr}$ )
- However, with prolonged exposure you should remove external clothing to mitigate hazards

# Persistence and Decon

2 of 2

- Immediately decon liquid TICs – before medical treatment
- Avoid items and areas for several hours after large liquid TIC release or perform active decon
- Soap and water is generally effective for most TICs – BUT NOT ALL, before use ensure TIC is not reactive with the solution
- Weathering is a safe means of decon for large areas or equipment that does not require immediate use

# Documentation

- DoD policy requires that significant exposure be documented and archived
- Record the following information and submit through appropriate channels:
  - Unit name and roster of involved personnel
  - Summary of medical treatment
  - PPE used and its effectiveness
  - Sampling results (exposure level information)
  - Health risk communication materials used



# TIC Categories and Examples

1 of 6

- Physical Hazards – flammable fuel gases and liquids store in large quantities may be explosive.

Examples include:

- Propane
- Toluene
- Methane



# TIC Categories and Examples

2 of 6

- Irritant gases – cause irritation and swelling affecting the eyes, nose, and respiratory tract. Examples include:
  - Ammonia
  - Chlorine
  - Formaldehyde
- Short exposure could result in coughing & asthma-like symptoms
- Severe exposure = fluid in lungs and death



# TIC Categories and Examples

3 of 6

- Corrosives – similar to irritants but will cause immediate cell damage as opposed to inflammation. Examples include:
  - Nitric acid
  - Sulfuric acid
  - Hydrofluoric acid



# TIC Categories and Examples

4 of 6

## Asphyxiants:

- (1) simple – displace oxygen in the air Examples include:
  - Carbon dioxide, Methane, Propane
- (2) systemic – affect the ability of the body to properly transport and use oxygen Examples include:
  - Carbon monoxide, Cyanides, Hydrogen sulfide

# TIC Categories and Examples

5 of 6

- Cholinergics – cause overstimulation of nerve cells which results in a wide range of effects. This is the same mechanism used by some chemical weapons like Sarin. Examples include:
  - Parathion
  - Malathion
- Mild effects = runny nose, reduced pupil size, short of breath
- Moderate effects = excessive salivation, sweating, nausea, involuntary defecation . . .
- Severe effects = seizures, paralysis, coma, and death

# TIC Categories and Examples

6 of 6

Other systemic poisons:

- Arsine is a toxic gas that destroys red blood cells
- Some TICs could be used to contaminate drinking water and cause immediate illness:
  - Arsenic
  - Mercury
  - Sodium Cyanide
  - Thallium Sulfate

# Handling Bodies of Victims

- Unburied human remains are not a disease threat
- Increased number of filth flies can increase diarrheal diseases.
- Mortuary staff, and body retrieval teams risk exposure to hepatitis B virus (HBV) and HIV
- For personnel exposed to blood and body fluids:
  - Use gloves when handling bodies or body fluids
  - Use eye protection, gowns, and masks when large quantities or splashes of blood are anticipated
  - Wash hands frequently
  - Use body bags to reduce the risk of contamination





# Universal Precautions

- **Universal Precautions or Standard Precautions**
  - are the terms used to describe a prevention strategy in which all blood, potentially infectious materials, and respiratory secretions are treated as if they are, in fact, infectious, regardless of the perceived status of the source individual.
- In other words:  
**Whether or not you think the blood/body fluid is infected with bloodborne pathogens, *you treat it as if it is.***



# Improve Resistance to Stress

1 of 2

- Remember the larger purpose of what you must do. You are showing care, giving hope, and preventing disease for the living. You are recovering the bodies for registrations and respectful burial.
- Limit exposure to the stimuli.
- Mask odors with disinfectants, deodorants, and fresheners.
- AVOID FOCUSING on any individual victims.
- Have people who did NOT search the body examine any materials collected for identification of the body or intelligence.
- Remind yourself the body is not “the person,” just the remains.



# Improve Resistance to Stress

2 of 2

- **Keep humor alive**
- **Don't desecrate or steal from the victims**
- **Schedule frequent breaks; maintain hygiene, drink plenty of fluids, and eat good food.**
- **Have your team get together for mutual support and encouragement.**
- **Help buddies or subordinates in distress by being a good listener.**
- **Prepare yourself for what you will see and do.**
- **Don't feel guilty about distancing yourself mentally from the suffering of individuals.**
- **Don't be disheartened by horrible dreams, feeling tense, or intrusive memories.**
- **Participate in a critical event debriefing with trained people from your supporting unit ministry and/or behavioral health/combat stress control team.**



# Post-Deployment

All AC and those RC personnel activated more than 30 days must:

- Complete Post-Deployment Medical Health Assessment (DD Form 2796)
- Receive post-deployment preventive medicine briefing
- Receive post-deployment screening, testing, and follow-up



# Summary

- Background
- Health Risks, Exposure, and Protection
- TIC Examples
- Stress
- Post Deployment



# **Additional Resources**

**1 of 2**

**USACHPPM Hazardous and Toxic Industrial  
Chemicals Tables, August 2007;**

**<http://chppm-www.apgea.army.mil/chemicalagent/PDFFiles/TICResponseCharts.pdf>**

**USACHPPM Technical Guide 273 Diagnosis and  
Treatment of Diseases of Tactical Importance to U.S  
Central Command, Part 4 Toxic Industrial Chemicals  
<http://chppm-www.apgea.army.mil/news/TG273OCTOBER2005FINAL.pdf>**

**USACHPPM Technical Guide (TG) 244 Medical CBRN  
(NBC) Battlebook  
<http://chppm-www.apgea.army.mil/documents/TG/TECHGUID/tg244.pdf>**

# **Additional Resources**

**2 of 2**

**Prioritizing Industrial Chemical Hazards; JTEH, part A, 68:857-876, 2005, Hauschild V.D, Bratt G.M.**

**USACHPPM Technical Guide (TG) 230 Chemical Exposure Guidelines for Deployed Military Personnel:  
<http://chppm-www.apgea.army.mil/documents/TG/TECHGUID/TG230.pdf>**

**Emergency Response Guidebook (for evacuation distances)  
<http://hazmat.dot.gov/pubs/erg/gydebook.htm>**

**NIOSH Pocket Guide to Chemical Hazards (chemical-specific info including guidance on civilian PPE levels) <http://www.cdc.gov/niosh/npg/>**

# Questions





# **Contact Your Local Preventive Medicine Service or Medical Support Unit for Additional Information**



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